

Research Note

***Moniliformis clarki* (Acanthocephala: Moniliformidae) from the Pocket Gopher, *Geomys bursarius missouriensis*, in Missouri**

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ABSTRACT: The North American moniliformid acanthocephalan, *Moniliformis clarki* (Ward, 1917) Chandler, 1921 (nec Van Cleave, 1924) is reported for the first time in Missouri from the pocket gopher, *Geomys bursarius missouriensis*. Intensity and mean intensity of *M. clarki* infection were 2–20 and 7.3 per individual, respectively. The diagnostic characteristics of proboscis armature and egg size conformed to those of *M. clarki*. Other anatomical structures were closer in size to those of the other cosmopolitan moniliformid acanthocephalan *Moniliformis moniliformis* (Bremser, 1811) Travassos, 1915.

KEY WORDS: *Moniliformis clarki*, pocket gopher, *Geomys bursarius missouriensis*, Missouri, new records.

Eleven species of the genus *Moniliformis* Travassos, 1915 have been described (Amin, 1985). Two of these species infect North American mammals. *Moniliformis moniliformis* (Bremser, 1811) Travassos, 1915 (= *Moniliformis dubius* Meyer, 1932 designated for North American forms) is a cosmopolitan species that infects rats. It was first reported in the United States by Chandler (1921) from Houston, Texas. *Moniliformis clarki* (Ward, 1917) Chandler, 1921 (nec Van Cleave, 1924) is found only in North American squirrels, moles, chipmunks and deer mice, and less frequently in pocket gophers and skunks. It was first identified by Ward (1917), recognized as distinct by Chandler (1921), and described by Van Cleave (1924). The validity of the 2 North American species of *Moniliformis* has been established on morphological characteristics (Van Cleave, 1953; Buckner and Nickol, 1975a) and on experimental evidence (Buckner and Nickol, 1975b).

Fifty-one *Moniliformis clarki* (8 males, 43 females) were collected from 6 (3 males, 3 females) pocket gophers (*Geomys bursarius missouriensis* McLaughlin, 1958) trapped (using Victor gopher traps) 2.5 km NE of Chesterfield Airport, St. Louis County, Missouri (38°39'N, 90°39'W; elevation 154 m) on 26 March 1994. These are new host and geographical records. *M. clarki* was collected

from *Geomys bursarius illinoensis* in Illinois (Van Cleave, 1953). The intensity of *M. clarki* in each gopher ranged from 2–20 worms with a mean intensity of 7.3. These are considered light infections as compared to a record of 375 *M. clarki* specimens removed from the intestine of a single gray squirrel from Arkansas (Singleton et al., 1993).

Acanthocephalans were present throughout the whole intestine, where they were initially preserved in acetic acid-formalin-alcohol (AFA). Some were transferred to 75% ethanol, stained in acid carmine, dehydrated in ascending concentrations of ethanol, cleared in graded concentrations of terpineol in 100% ethanol, and mounted in Canada balsam. Measurements are in micrometers unless otherwise stated with means in parentheses following the range. Eggs were removed from the body cavities of 2 females before being measured.

Five males were 61–85 mm (72) long by 1.6–2.0 mm (1.8) maximum width and 25 females were 120–250 mm (156) long by 2.1–2.8 mm (2.4) wide. Specimens were identified as *M. clarki* based on their proboscis armature (12 or 13 longitudinal rows of 6 or 7 hooks each; largest hooks 23–28 (24) [$N = 5$ males; not available in females], egg size 56–93 (81) long by 36–50 (43) wide ($N = 15$) and host. Other measurements from 5 males are: Proboscis 416–520 (463) long by 130–143 (137) wide. Proboscis receptacle 650–676 (658) long by 325–338 (330) wide. Lemnisci 3,462–4,793 (4,215) long by 132–182 (161) wide. Anterior testis 3,306–5,620 (4,417) long by 727–1,157 (903) wide. Posterior testis 3,957–4,297 (4,076) long by 723–1,171 (905) wide. All females were gravid with the internal structures obscured by eggs, retracted proboscides, and associated muscles.

The diagnostic characteristics of proboscis armature and sizes of hooks and eggs conformed to those of *M. clarki*. Other measurements were within the upper range of this species and the

"usual" range for *M. moniliformis*. These observations confirm the wide range of morphological variations reported for moniliformid acanthocephalans. These size variations could be a cause of some of the confusion on the taxonomic status of *M. clarki* and *M. moniliformis* in North America. Populations of these 2 acanthocephalan species exhibit considerable variability, depending on host and geographical distribution; see Chandler (1921, 1941), Van Cleave (1924, 1953), Petrochenko (1958), and Buckner and Nickol (1975a, b). This is the first morphological study of *M. clarki* from *G. bursarius missouriensis*.

SPECIMENS: Three male and 4 female *M. clarki* on 7 slides in the University of Nebraska State Museum, Harold W. Manter Laboratory Coll. 38227.

HOSTS. Skulls in the Museum of High Plains, Fort Hays, Kansas Coll. nos. 31075, 31077, 31108, 31122, 31126, 31135, 31141 (one gopher was not infected).

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Research Note

The Raccoon as Intermediate Host of Three *Sarcocystis* Species in Europe

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ABSTRACT: One out of 12 raccoons from German Zoos was found to possess musculature infected by sarcocysts of 2 distinct *Sarcocystis* species (*S. sp. 1* and *S. sp. 2*). The cyst wall of *S. sp. 1* had fingerlike, and that of *S. sp. 2* hairlike, villar protrusions. Two out of 45 raccoons from a free-ranging population in Germany showed infection of the muscle by a third *Sarcocystis* species (*S. cf. sebeki*, without villar protrusions of the cyst wall). None of the 3 species is identical with *Sarcocystis kirkpatricki*, described from raccoons in North America.

KEY WORDS: raccoon, *Procyon lotor*, *Sarcocystis*.

Free-ranging raccoons, *Procyon lotor* L., in North America are known as intermediate hosts of *Sarcocystis kirkpatricki* Snyder et al., 1990. In Europe raccoons occur not only in zoos but also free in certain areas. Since we are unaware of reports of *Sarcocystis* spp. in raccoons in Europe, we decided to investigate whether the raccoons in North America and Europe are parasitized by the same or different *Sarcocystis* species.

Seven raccoons originated from the Leipzig